**DOCUMENT RESUME**

ED 396 923 SE 058 535

| | |
|---|---|
| AUTHOR | Triana, Estrella M.; Rodriguez, Manuel Gomez |
| TITLE | United-Unidos: Mathematics and Science for Hispanics. |
| INSTITUTION | American Association for the Advancement of Science, Washington, D.C. |
| SPONS AGENCY | National Science Foundation, Arlington, VA. |
| REPORT NO | ISBN-0-87168-518-3 |
| PUB DATE | 93 |
| CONTRACT | HRD-9255271 |
| NOTE | 51p. |
| AVAILABLE FROM | American Association for the Advancement of Science, 1333 H Street N.W., Washington, DC 20005 ($9.95 plus postage and handling). |
| PUB TYPE | Reports - Descriptive (141) |
| EDRS PRICE | MF01/PC03 Plus Postage. |
| DESCRIPTORS | Disadvantaged; Elementary Secondary Education; Higher Education; *Hispanic Americans; *Mathematics Education; Minority Groups; *Science Education; Students |
| IDENTIFIERS | *Hispanic American Students; *National Education Goals 1990 |

ABSTRACT

Professional and community organizations gathered for a weekend summit in May 1992 to articulate how the National Education Goal 4 ("U.S. students will be first in the world in science and mathematics achievement") could be achieved within the Hispanic community. This publication summarizes the major education issues, and highlights the summit recommendations and the formation of the Hispanic Secretariat for Mathematics and Science Education that resulted from the gathering. It discusses the status of the education of Hispanics, including barriers from grade school to higher education, and addresses the underrepresentation of Hispanics in mathematics and science careers. Recommended goals are presented under the following headings: curriculum and skills K-12, preparing the best educators, parent involvement, and higher education. A list of summit participants is appended. (MKR)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

UNITED-UNIDOS

ED 396 923

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

E. González

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

# MATHEMATICS and SCIENCE for HISPANICS

Estella M. Triana
Manuel Gomez Rodriguez

2

# United-Unidos

## MATHEMATICS and SCIENCE for HISPANICS

# United-Unidos

## MATHEMATICS and SCIENCE for HISPANICS

---

Estrella M. Triana
Manuel Gomez Rodriguez

American Association for the
Advancement of Science

The AAAS Board of Directors, in accordance with Association policy, has approved the publication of this work as a contribution to the understanding of an important area. The MASH Summit and this publication were supported by a grant from the National Science Foundation (HRD-9255271). Any interpretations and conclusions are those of the authors and do not necessarily represent views of the AAAS Board, the AAAS Council or the National Science Foundation.

Copyright ©1993
by the

American Association for the Advancement of Science
(AAAS)
1333 H Street, N.W., Washington, DC 20005

ISBN: 0-87168-518-3
AAAS Publication: 93-13S

# Contents

**Tables and Figures** ..... *vii*

**Preface** ..... *ix*

**List of Contributors** ..... *xi*

**Acknowledgements** ..... *xiii*

**Introduction: Science and Mathematics for All** ..... *1*

**Education and the Status of Hispanics** ..... *5*

**Mathematics and Science for Hispanics (MASH) Summit** ..... *17*

**MASH Message** ..... 27

**Afterthoughts** ..... 29

**The Future** ..... *33*

**United-Unidos** ..... *35*

**List of MASH Participants** ..... *39*

**About AAAS** ..... *41*

**Hispanic Initatives** ..... *43*

# Tables and Figures

## Tables

1. NAEP Mathematics Achievement Levels ..... 7

2. NAEP Science Scale ..... 8

3. Hispanic Citizens Doctorate Recipients by Field and Subgroup ..... 13

## Figure

1. Percent of science and engineering doctorates who attended a 2–year college, by race/ethnicity ..... 10

2. Percentage of science and engineering bachelor's and master's recipients by U.S. minorities, 1977 and 1987 ..... 11

# Preface

The education reform movement has been in the foreground of public attention in the last three years. Increased public awareness due to President Bush's 1989 Education Summit with the Nation's governors resulted in the development of the National Education Goals and the Bush Administration's strategy, America 2000, to accomplish these goals. This increased focus on education reform served to set the stage for Hispanics' call to action. Building on this foundation, 11 professional and community organizations gathered in Chantilly, Virginia for a weekend retreat to articulate how the National Education Goal 4 ("U.S. students will be first in the world in science and mathematics achievement") can be achieved within the Hispanic community. The **Mathematics and Science for Hispanics (MASH) Summit,** undertaken with the support of the National Science Foundation and American Association for the Advancement of Science (AAAS), marks an unprecedented gathering of national professional and community organizations.

This publication summarizes the major education issues, and highlights the MASH Summit recommendations, and the formation of the Hispanic Secretariat for Mathematics and Science Education that resulted from the Summit gathering. It is our hope that the union of these organizations becomes stronger and works together to chip away the barriers that Hispanics face in science and mathematics education. It is through these unified efforts that Hispanics can influence policy and funding that will affect science and mathematics education programs and prepare Hispanics for the opportunities of tomorrow.

**Manuel Gomez Rodriguez**
Chair, AAAS Committee on Opportunities in Science

**Estrella M. Triana**
Hispanic Initiatives Director, AAAS

# List of Contributors

**Leonard Abeyta**
*Society of Hispanic Professional Engineers*

**Diane Cabrales**
*National Council of La Raza*

**George Castro**
*Society for the Advancement of Chicanos & Native Americans in Science and Engineering*

**Pablo Clemente-Colón**
*Association of Puerto Ricans in Science and Engineering*

**Eugene Cota-Robles**
*Society for the Advancement of Chicanos & Native Americans in Science and Engineering*

**Hilda Crespo**
*ASPIRA Association Inc.*

**Manuel Gomez Rodriguez**
*American Association for the Advancement of Science, Committee on Opportunities in Science, Chair*

**Ralph Gonzalez**
*Society of Mexican American Engineers and Scientists*

**Ciriaco Gonzales**
*Society for the Advancement of Chicanos & Native Americans in Science and Engineering*

**Gil Gutierrez**
*SER-Jobs for Progress National, Inc.*

**Robert Guzman**
*Society of Hispanic Professional Engineers*

**Rafael J. Magallan**
*Hispanic Association of Colleges and Universities*

**Betty Mandel**
*Society of Mexican Americans Engineers and Scientists & Hispanic Secretariat on Mathematics and Science Education, Steering Committee Chair*

**Hipolito V. Niño**
*Interamerican College of Physicians and Surgeons*

**Ada Peña**
*League of United Latin American Citizens*

**Richard Roybal**
*LULAC National Educational Service Centers*

**Estrella M. Triana**
*American Association for the Advancement of Science*

# Acknowledgements

The authors would like to thank the MASH participants for their contributions. In particular, a special note of appreciation to Betty Mandel, Eugene Cota-Rubles and Ralph Gonzalez whose advise and additional work after the MASH Summit helped to shape the final product. In addition, we like to thank the members of the AAAS staff who made this book possible: Tracy Gath, provided the creative editing and proofing; Gloria Gilbert and Maria Sosa provided the expert formatting, and meticulously handled the production process; and Shirley Malcom who supported, guided and generally helped to make the MASH Summit and this publication a reality.

# Introduction
# Science and Mathematics For All

A number of reports have signaled the need for education reform, yet none as emphatically as the two reports *A Nation at Risk*, submitted to the Secretary of Education by the National Commission on Excellence in Education, and *A Nation Prepared: Teachers for the 21st Century*, produced by the Carnegie Forum on Education and the Economy. The former report, released in 1983, informed the public that the nation's standards in education had declined and that it was necessary to return to original standards. In contrast, the 1986 Carnegie report summarized the reasons for education reform as the imperative response to technological changes in the world. It emphasized that students needed to reach standards and achieve skills never before accomplished by our schools. The report also noted that such standards would have to be reached by all students, not just an elite. In reaction to heightened public awareness and concern for goals as a result of these reports, many states increased requirements for graduation from high school, especially in science and mathematics.

Since these reports, a number of meetings and a plethora of conferences and resultant reports addressing reform issues ensued. Clearly, these meetings indicated the nation needed specific goal statements. The Mathematical Sciences Education Board's *Everybody Counts* which addressed the need for making mathematics accessible to all children, and AAAS Project 2061, that outlined what every high school graduate should know about science, began to fill this need. These reform efforts in turn called for broadening thinking and opening the door to equity in education. In short, since science and mathematics were essential for everyone, reform in these areas would constitute the foundation for rebuilding the nation's education system: a system that would emphasize equity *and* excellence.

These reform efforts led to the Education Summit, which was held in 1989 in Charlottesville, Virginia. The unprecedented summit brought the President and the nation's governors together to establish a set of educational goals for America. Among these goals was the commit-

ment to be the first in the world in mathematics and science achievement by the year 2000. Following the summit, the administration proposed a strategy, America 2000, to ensure that the nation would meet these goals. Shortly thereafter, Executive Order 12729, Educational Excellence for Hispanic Americans was issued "to strengthen America's capacity to provide quality education to Hispanic Americans consistent with the National Education Goals."

While these efforts are noteworthy, it is highly unlikely that strides will be made towards these goals if there is not an understanding that Hispanics are different groups of people — Mexican American, Puerto Rican, Cuban and Central and South American — with different needs. To accomplish the nation's education goals we must have the participation of each of these groups in planning strategies and implementing programs and policies. In addition, these efforts require that community organizations and science associations address jointly the barriers that Hispanic subgroups face in science and mathematics. With the Administration's strategy and the White House initiatives, the timing was optimum for members of community and science organizations to engage in focused dialogue on the preparation and participation of Hispanics in science and mathematics. The **Mathematics and Science for Hispanics Summit** in May 1992 successfully began the much needed conversation and laid the foundation for a united agenda.■

## References

Carnegie Forum on Education and the Economy. 1986. *A nation prepared: Teachers for the 21st century*. A report of the Task Force on Teaching as a Profession, New York; Carnegie.

Mathematical Sciences Education Board. 1985. *Everybody Counts*. Washington, DC: National Research Council.

National Commission on Excellence in Education. 1983. *A nation at risk: Imperative for educational reform*. Washington, DC: U.S. Department of Education.

Rendón, L.I. & Triana, E.M. 1989. *Making mathematics and science work for Hispanics*. Washington, DC: American Association for the Advancement of Science.

U.S. Department of Education. 1991. *America 2000: An education strategy*. Washington, DC: U.S. Department of Education.

# Education and the Status of Hispanics

Hispanics could make a significant contribution to the pool of scientists and engineers. Yet Hispanics, who represent 9 percent (22.4 million) of the U.S. population and constitute 7 percent of all employed persons, represent only 3 percent of all those employed in professional fields and 1.8 percent of all those employed as scientists and engineers. This last figure is cause for alarm since it signals declining rather than increasing participation. In comparison earlier National Science Foundation reports noted that 2.0 percent and 2.1 percent for 1986 and 1984, respectively, of all employed scientists and engineers were Hispanics.

According to *Changing America: The New Face of Science and Engineering*, the competitive edge of the country depends on drawing in traditionally underrepresented groups in science and mathematics-based fields (Task Force on Women, Minorities and the Handicapped in Science and Technology, 1989). Yet it is clear that large numbers of Hispanics will not make it to high school graduation, will not make it to college, and as a consequence, will not be part of the science and engineering talent pool. To explore Hispanics' shrinking science and engineering pipeline it is necessary to review the data and research on the education of Hispanics.

Disaggregated data are difficult to find, and generalizing to all Hispanic subgroups should be done with caution. Attempts have been made to update data from the 1989 publication from AAAS, *Making Mathematics and Science Work for Hispanics*. It should be noted that this overview underscores the concerns that helped to shape and structure the MASH Summit and, ultimately assisted in outlining directions for future action.

## Barriers from Grade School to High School

- **Hispanics are less likely to have had early childhood education experiences.** Hispanic children enter school already behind. Programs that are perceived to add to school success, such as Head Start and pre-school programs, have little Hispanic

participation. In 1990, 31 percent of Hispanic 3–4 year olds, compared to 47 percent of Anglo and 42 percent of African American children, were enrolled in preschool programs (National Center for Education Statistics, 1991).

- **Hispanics are more likely to be enrolled below grade level and tend to be retained one or more grades.** Data from 1988 indicate that, as a result of academic performance, absences and other factors, 24.5 percent of Hispanics in grades 1–4 are enrolled below grade level, compared to 22.5 percent of White non-Hispanics and 21.8 percent of African Americans. While these figures for grades 11–12 increase for Whites and Blacks, they double for Hispanics. The National Education Longitudinal Study (1990) reports that in 1988, 15.2 percent of Hispanic eighth graders were retained two or more times, compared to 11.5 percent of White non-Hispanics, and 13.7 percent of Blacks. Since research indicates that grade retention is the single best predictor of school drop out, it is not surprising that Hispanics have higher drop-out rate than Anglos and Blacks. In 1990, the Hispanic dropout rate was 32.4 percent among 14 to 24 year olds compared to drop out rate for White non-Hispanics and Blacks at 12.0 percent and 13.2 percent, respectively.

- **National Assessment of Education Progress (NAEP) reports indicate that Hispanics' average mathematics and science proficiency are based mostly at the lower cognitive levels.** Preliminary national estimates from NAEP mathematics assessment (1993) indicate that the average mathematics proficiency had increased for Hispanics in grades 4, 8 and 12. However, these gains are in the lower levels at which students are expected to demonstrate "some evidence of understanding the mathematical concepts and procedures." As seen in Table 1, in 1992 the percentage of Hispanics at the below basic and basic achievement levels for all three grades shows improvement from 1990 data. In comparison, the estimated percentage of Hispanics in the proficient and advanced levels for all three grades reveals little to no gains.

**Table 1 – NAEP Mathematics Achievement Levels**
Percentage of students at or above four proficiency levels for 1990 and 1992

| Proficiency Level | | Hispanic | | White | | Total | |
|---|---|---|---|---|---|---|---|
| | | 1992 | 1990 | 1992 | 1990 | 1992 | 1990 |
| Grade 4 | Below Basic | 63 | 66 | 28 | 36 | 39 | 46 |
| | Basic | 37 | 34 | 72 | 64 | 61 | 54 |
| | Proficient | 6 | 5 | 23 | 17 | 18 | 13 |
| | Advanced | 0 | 0 | 3 | 2 | 2 | 1 |
| Grade 8 | Below Basic | 61 | 62 | 26 | 32 | 37 | 42 |
| | Basic | 39 | 38 | 74 | 68 | 63 | 58 |
| | Proficient | 8 | 6 | 32 | 24 | 25 | 20 |
| | Advanced | 1 | 0 | 4 | 3 | 4 | 2 |
| Grade 12 | Below Basic | 55 | 63 | 28 | 33 | 36 | 41 |
| | Basic | 45 | 37 | 72 | 76 | 64 | 59 |
| | Proficient | 6 | 4 | 19 | 16 | 16 | 13 |
| | Advanced | 1 | 0 | 2 | 2 | 2 | 2 |

SOURCE: 1992 NAEP Preliminary Report, Mathematics Assessement, NAEP 1993.

Similarly, the NAEP science report (1992) indicates that the percentage of Hispanic students who performed at the lower levels in grades 4, 8, and 12 is greater than for their White counterparts. As seen in Table 2, Hispanics score predominantly in the 200 and 250 level. At these levels students demonstrate an "understanding of simple scientific principles and apply general scientific information." In contrast, at the 300 and 350 levels students are expected to "analyze scientific procedures and data and integrate specialized scientific information." The percentage of Hispanics at this level, especially in grades 8 and 12, is particularly low.

**Table 2 – NAEP Science Scale**
Percentage of students who scored at or above four proficiency levels for 1990

| Proficiency Level | | Hispanic | White | Total |
|---|---|---|---|---|
| Grade 4 | 200 | 65.9 | 93.1 | 84.5 |
| | 250 | 9.8 | 39.6 | 30.6 |
| | 300 | 0.0 | 1.3 | 1.0 |
| | 350 | 0.0 | 0.0 | 0.0 |
| Grade 8 | 200 | 86.6 | 97.4 | 93.6 |
| | 250 | 41.7 | 74.1 | 64.1 |
| | 300 | 4.8 | 23.1 | 17.9 |
| | 350 | 0.1 | 0.9 | 0.7 |
| Grade 12 | 200 | 97.5 | 99.6 | 98.6 |
| | 250 | 70.3 | 90.7 | 84.1 |
| | 300 | 23.1 | 52.8 | 44.7 |
| | 350 | 2.9 | 11.5 | 9.4 |

SOURCE: The 1990 Science Report Card, NAEP, 1992.

- **Hispanics are more likely to be enrolled in remedial mathematics and science courses and less likely to be enrolled in college preparatory mathematics and science courses.** According to *1987 High School Transcript Study*, 43 percent of Hispanics, compared to 21 percent of White non-Hispanics had taken a remedial math course. In contrast, 8 percent of Hispanics and 18 percent of White non-Hispanics had taken biology, chemistry, and physics courses. Similarly, 40 percent of Hispanics compared to 65 percent of their White counterparts had taken geometry. As a result Hispanics earn fewer credits for one year of study in an academic area — known as Carnegie Units — than White non-Hispanic students. This is one of the main contributors to the lack of preparation and consequently to failure to pursue mathematics and scientific fields of study.

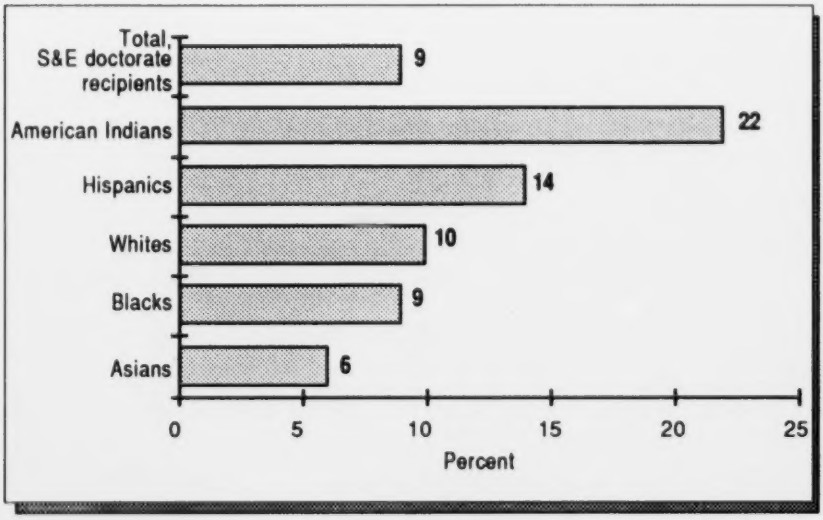
## Barriers in Higher Education

- **Poor retention rates plague Hispanics throughout their higher education.** College completion rates have vacillated between 10 to 18 percent for Hispanics between 1974 and 1987. In comparison, rates for White non-Hispanics ranged between 26 to 28 percent. Failure by Hispanics to complete college can be attributed to a number of factors. Three of the primary factors are lack of funds, family responsibilities, and school environment (National Council of La Raza, 1990). Among these, lack of financial assistance may be the top contributor to lower persistance because of the low socio-economic levels of Hispanic students. As a consequence of cut-backs, student loans, and university assistantships have been reduced and are more difficult to obtain; this has placed Hispanics at even greater risk of dropping out.
- **Hispanics are more likely to use community colleges as an entry to higher education and less likely to complete a successful transition to four-year colleges.** According to the National Science Foundation (1992) 14 percent of Hispanic science and engineering doctorate recipients and 22 percent of

American Indians had attended a two year college. In comparison, 10 percent of White 9 percent of Black and 6 percent of Asian science and engineering doctorate recipients had attended two year colleges (see Figure 1). These figures may indicate that two year colleges play a significant role in the science and engineering education pipeline for Hispanics and American Indians.

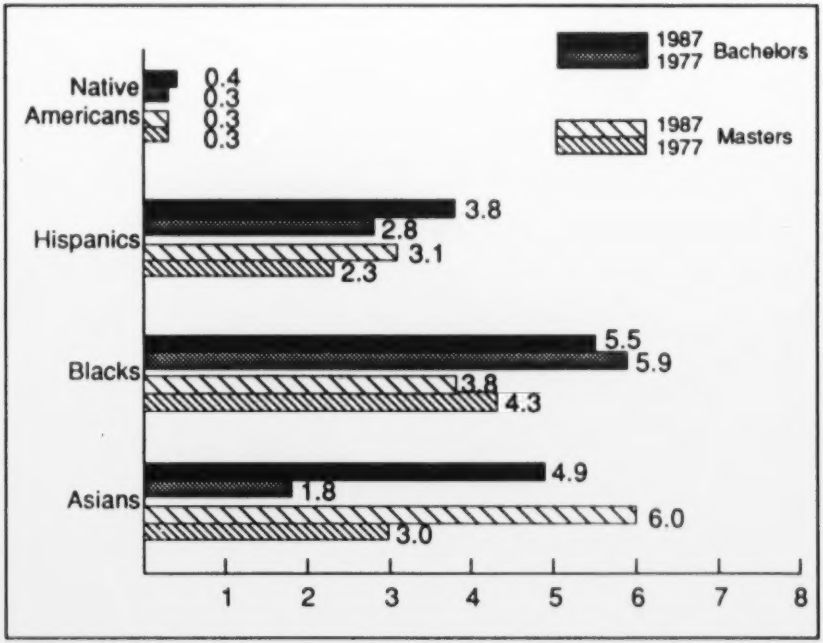
Overall, about 50 percent of all Hispanics enrolled in higher education in 1986 were enrolled in community colleges (Rendón and Triana, 1989). Given this high percentage, Hispanic transfer rates to four-year colleges, ranging between 5 to 30 percent nationally, are disappointingly low.

**Figure 1** – Percent of science and engineering doctorates who attended a 2–year college, by race/ethnicity




SOURCE: National Science Foundation/SRS, *Undergraduate Origins of Recent Science and Engineering Doctorate Recipients, 1992.*

**Figure 2** – Percentage of Science and Engineering Bachelor's and Master's Recipients by U.S. Minorities, 1977 and 1987




SOURCE: *Women and Minorities in Science and Engineering*, National Science Foundation, 1990.

- **While the number of bachelor's and master's degree recipients has risen for Hispanics, it is not proportionate to their numbers.** Figure 2 shows the increases in degree attainment over 10 years for Hispanics who are U.S. citizens and permanent residents compared to Asians, Blacks and Native Americans (NSF, 1990). In 1987, of the 383,618 bachelor's degrees awarded, 3.8 percent were granted to Hispanics. In the same year, out of 64,718 masters degrees awarded 3.1 percent were granted to Hispanics. Despite the gains, the fastest growing minority population continues to lag behind in the number of bachelor's and master's degrees earned.

- **Disaggregated data from the National Research Council (1993) indicates a difference among Hispanic subgroups in the number and proportion of doctorates awarded in science and engineering compared to their population proportions.** Of the 14,555 total doctorates awarded to U.S. citizens in science and engineering fields in 1991, only 400 were awarded to Hispanics. As Table 3 shows, Puerto Ricans and Mexican Americans earned slightly over half of the science and engineering doctorates awarded to Hispanics although these groups comprise the overwhelming majority of the Hispanic population. Of the 80 doctorates awarded to Hispanics in the physical sciences, 20 were awarded to Puerto Ricans and 21 to Mexican Americans. In engineering, of the 47 doctorates awarded to Hispanics, 9 were awarded to Puerto Ricans and 14 were awarded to Mexican Americans. Given that Mexican Americans comprise 63 percent of the U.S. Hispanic population, they actually earned the lowest proportion of doctorates.

  Unlike Puerto Ricans, Mexican American do not have the benefit of universities that primarily serve them. In the National Science Foundation report *Undergraduate Origins of Recent Science and Engineering Doctorate Recipients*, data show that between 1985 and 1990 the majority of Hispanic science and engineering doctorates had received their bachelor's from one of 23 institutions (NSF 1992, 35). Overall, the top 23 institutions listed in the NSF report accounted for the baccalaureate origins of 714 Hispanic science and engineering doctorate recipients. Puerto Rican-based universities impressively accounted for almost half. Furthermore, the top two institutions, based in Puerto Rico, accounted for baccalaureate origins of 299 Hispanic science and engineering doctorate recipients. In comparison, each of the remaining 21 universities accounted for baccalaureate origins of 30 or fewer Hispanic doctorate recipients.

**Table 3 – Hispanic Citizens Doctorate Recipients by Field and Subgroup**

| Doctoral Field | Puerto Rican | Mexican American | Other Hispanic | Total |
|---|---|---|---|---|
| Physical Science | 20 | 21 | 39 | 80 |
| Engineering | 9 | 14 | 24 | 47 |
| Life Sciences | 24 | 27 | 46 | 97 |
| Social Sciences | 45 | 51 | 80 | 176 |

SOURCE: Doctorate Recipients From United States Universities 1991, National Research Council, 1993.

- **Two- and four- yea: colleges have few Hispanic faculty and staff.** One of the key contributors to student persistance is having role models who can act as mentors and encourage Hispanics throughout their higher education. As Rendón and Triana (1989) reported, only 3 percent of the faculty at four-year institutions in Texas and California are Hispanic, two of the states with the highest Hispanic population. Similarly, two-year colleges in Texas and California have only 7.8 percent and 4.9 percent, respectively, Hispanic faculty.■

## References


Kulm, G. 1990. *Assessing higher order thinking in mathematics*. Washington, DC: American Association for the Advancement of Science.

Kulm, G. & Malcom, S.M. (eds.) 1991. *Science assessment in the service of reform*. Washington, DC: American Association for the Advancement of Science.

Marinez, D.I. & Ortiz de Montellano, B. 1983, May. *Teaching culturally relevant science*. Paper presented at the 1983 Michigan Annual Hispanic Education Conference, Dearborn, MI.

National Assessment of Educational Progress. 1992. *The 1990 science report card: NAEP's assessment of fourth, eight, and twelfth graders*. Princeton, NJ: Educational Testing Service.

National Center for Education Statistics. 1993. *A preliminary report of national estimates from the national assessment of educational progress 1992 mathematics assessment*. Washington, DC: U.S. Department of Education.

National Center for Education Statistics. 1991. *Digest of education statistics: 1991*. Washington, DC: U.S. Department of Education.

National Center for Education Statistics. 1990. *National education longitutdinal study, A profile of the American eighth grader: NELS:88 student descriptive summary*. Washington, DC: U.S. Department of Education.

National Center for Education Statistics. 1989. *High school transcript study, 1987*. Washington, DC: U.S. Department of Education.

National Council of La Raza. 1992. *State of Hispanic America: An overview*. Washington, DC: National Council of La Raza.

National Council of La Raza. 1990. *Hispanic education: A statistical portrait 1990*. Washington, DC: National Council of La Raza.

National Science Foundation. 1992. *Undergraduate orginins of recent science and engineering doctorate recipients*. Washington, DC: National Science Foundation.

National Science Foundation. 1990. *Women and minorities in science and engineering*. Washington, DC: National Science Foundation.

National Science Foundation. 1988. *Women and minorities in science and engineering*. Washington, DC: National Science Foundation.

National Research Council. 1993. *Summary report 1991: Doctorate Recipients from United States Universities*. Washington, DC: National Academy Press.

Rendón, L.I. & Triana, E.M. 1989. *Making mathematics and science work for Hispanics*. Washington, DC: American Association for the Advancement of Science.

Task Force on Women, Minorities and the Handicapped in Science and Technology. 1989. *Changing America: The new face of science and engineering*. Washington, DC: National Science Foundation.

U.S. Bureau of the Census. 1991. *The Hispanic Population of the United States: March 1991*. Current Population Reports, Population Characteristics, Series P-20, No. 455. Washington, DC: U.S. Bureau of Census.

# Mathematics and Science for Hispanics (MASH) Summit

Eleven national Hispanic community and science organizations met May 15–17, 1992, to examine and explore variables that impact Hispanic participation in science and mathematics. The three-day MASH Summit outlined recommendations for reform efforts. The Summit participants divided into four groups to discuss curriculum for and skills of K–12 Hispanic students, how to prepare the best educators, how to assist parents with their role in education, and higher education concerns. At the conclusion of the Summit, the recommendations of each group were discussed and approved. This section presents these recommendations to guide the policymakers, educators, and government and private agencies who are concerned with the education of Hispanics in science and mathematics.

## A. Curriculum and Skills for K–12

The study of science and mathematics can provide youth with numerous advantages. It is necessary to ensure that all Hispanic students are provided with higher mathematics skills needed to succeed in college. Such skills need to be provided in a natural, sequential order, commencing with culturally relevant and hands-on, problem-solving experiences, particularly from grades K–7. Such exposure to mathematics and science should emphasize the creative and pleasurable aspects of learning by natural discovery.

### *Recommended Goals*

- Eliminate all educational tracking for Hispanic students.
- Promote a vigorous academic core curriculum with a heavy emphasis on mathematics and science education.
- Eliminate any performance gaps in mathematics and science between Hispanic and White non-Hispanic students by the 5th grade.

- Develop and employ mathematics and science curriculum that incorporates culturally relevant, real world contexts and that emphasizes experiential learning.
- Expose Hispanics early (in grades 3–6) to calculators, math laboratories, and computers for learning mathematical concepts.
- Provide ready access to computers for all Hispanic youth in grades 7–12.
- Provide relevant interactive mathematics and science education software.
- Ensure that Hispanic students enroll in and successfully complete the algebra-geometry-trigonometry sequence by the end of the 11th grade.

## B. Preparing the Best Educators

With the changing demographics in classrooms, bilingual teachers are needed now more than ever. All teachers will need to be prepared to bring culturally relevant materials into their classrooms and to familiarize themselves with teaching approaches that will engage *all* children in learning. Furthermore, teacher preparation in science and mathematics will need to be emphasized both in pre-service and in-service programs. Listed below are recommendations that can be incorporated immediately into existing programs and those recommendations that can be implemented over time.

### *Recommended Goals*

- Revise the selection criteria for the Presidential Awards for Teachers of Science and Mathematics in order to incorporate educators who demonstrate excellence in teaching minority and bilingual students. Additional criteria should stress educators' sensitivity to the differences of Hispanic and other minority cultures, involvement in the local school community with emphasis on outreach to parents, involvement in the local

Hispanic professional mathematics and science organizations, use of culturally relevant science and math perspectives, and demonstration of exemplary teaching techniques that utilize cooperative teaching methods.

- Include Hispanic educators in the selection process for recognitions such as the Presidential Awards for Teachers of Science and Mathematics and as reviewers in programs that focus on teacher enhancement, such as Dwight D. Eisenhower, U.S. Department of Education program and National Science Foundation programs.
- Make accessible database information created by federal agencies, such as National Science Foundation and U.S. Department of Education, by using no cost electronic communication bulletins and other dissemination systems. This would assist both the education community and the scientific community who are prevented by time contraints and resources from benefitting from existing education projects, and science professional conferences.
- Develop a guidebook for educators that highlights role models, and lists objectives and programs of minority organizations. Furthermore, the guidebook should be distributed to the top ten states with school districts with the highest Hispanic enrollment.
- Make funds available for school districts with the highest Hispanic enrollment to offer in-services/workshops that assist educators in utilizing role models and becoming familiar with science and mathematics careers.
- Present workshops that emphasize culturally relevant teaching at NSTA and NCTM conferences, as well as Hispanic professional science conferences.

## C. Parent Involvement

The critical period for parental interaction and intervention is with children in grades K–7. A proactive strategy should include making professional organizations' (POs) human resources available to parent and student groups through the community based organizations (CBOs). In particular, the K–7 time period is when children are most impressionable and can respond positively to parental guidance. Unfortunately, when parents are "turned off" on science, children are "turned-off" likewise. In addition, it is necessary to address cultural gender bias. A number of other important resources have been recognized as necessary for inclusion in the process; among these are not only parents but the extended family, the churches, and the community as a whole.

Our strategy for parental guidance and support would use existing resources, such as those available through the U.S. Department of Education, to develop new or existing working models. These models should provide "assembly" type forums to bring together parents, students, teachers, CBOs, and POs. These forums should concentrate on grades K–7.

### *Recommended Goals*

- Gain access to parents through personal contact with the students.
- Provide interactive parental guidance workshops that specify strategies for working with children and the school system. Workshops should also emphasize the importance and rewards of a career, as well as provide information on available resources for parents.
- Engage school counselors in workshops that promote interaction with parents and educate parents on counselors' responsibilities.
- Provide opportunities for teachers and parents to interact.
- Identify a bilingual liaison who will assist both the limited

English proficient parents as well as the parents who speak Spanish only.

- Familiarize parents with successful Hispanics in science and engineering.
- Invite role models to workshops to provide personal or one-to-one contact with parents and children. Ensure that role models are people that children and parents can relate to.
- Engage media who have the greatest influence on people's attitudes and perceptions. Develop public service announcements in English and Spanish that highlight role models, careers, and the importance of science and mathematics.

### *Source of Funding*

In the short term, financial resources for parental support must be identified clearly at the federal, state, and local levels. Sources for private funds should also be identified, keeping in mind that the private sector has a vested interest in the community. Available academic resources (colleges and universities) should also be identified. Finally, a mechanism for the dissemination of resource access information (RAI) must be developed. RAI must include not only what is available, but also information on how to effectively use financial, mentoring, and other resources. Workshops that provide instruction on applying and filing for financial assistance will be part of this effort.

## D. Higher Education

### *Creation of Centers of Excellence Dedicated to the Development of Hispanic Leadership in Science and Mathematics Education*

Although the Hispanic population is a fast increasing segment of the nation's population, their representation and leadership roles in science and mathematics education and academic research are lagging. This problem is due in good measure to the lack of institutions of higher education (colleges and universities) that have the capacity to specifi-

cally address the math and science developmental needs of Hispanic students. What is needed is Institutions of Higher Education with high standards of excellence that can provide a nurturing environment and that are conductive to the education of Hispanic students in sufficient numbers. At the same time, these institutions should be able to assume leadership roles in the schools, colleges and universities with high Hispanic enrollment. Without this leadership in place the Hispanic community will find it increasingly difficult to assume its proper and commensurate role in the nation's science and technology enterprise.

*Plan of Action*

Colleges/universities with a critical mass of Hispanic students do exist in at least 10 states, but they lack the will and/or resources and incentives to provide the nurturing environment necessary to graduate significant numbers of highly qualified Hispanics who can assume leadership roles in improving science and mathematics education and academic research in their communities and in the nation. In order to bring about the institutional changes needed to develop the Hispanic leadership in science and mathematics education and academic research, resources must be found to establish at least 10 colleges/universities as "Centers of Excellence for the Development of Hispanic Leadership in Science and Mathematics Education and Research." The funds would be assigned on a competitive basis to institutions with a significant Hispanic enrollment willing to make the institutional changes needed to respond to Hispanic students' needs. The participating institutions must commit themselves to at least achieve the following goals:

- Graduate Hispanic science and mathematics teachers, bachelor's and Ph.D. degree recipients in proportion to their enrollment, while maintaining the highest standards of academic excellence. Attrition rate for Hispanics should not be higher than for the majority population in the institution.
- Revise the curriculum of the science and mathematics courses that serve as "gate-keepers" and "bottlenecks" that impede the progress of students through the pipeline. The revised courses should play the role of inducting the student into the study of

science and math instead of serving as filters that hinder the progress through the pipeline.

- Make institutional changes needed to create a nurturing environment conducive to academic excellence and the development of self-esteem in the Hispanic students.
- Institute student-centered and participatory activities that will develop leadership qualities in the students.
- Provide research and scholarly work opportunities for the students.
- Sustain an academic research and scholarly activity in science and math with a significant Hispanic participation, that will be nationally recognized.
- Commit itself to increase the number of Hispanic faculty and academic administrators.
- Establish a strict assessment and accountability mechanism with specific quantifiable objectives that will assure the attainment of the stated goals.

### *Expected Outcome*

Within a period of 10 years at least 10 "Centers of Excellence for the Development of Hispanic Leadership in Science and Mathematics Education and Research" will be in place and will be nationally recognized as the source of Hispanic leadership in science and mathematics teaching, faculty and academic research.

### *Source of Funding*

Special funds for implementing this initiative would be obtained by the federal agencies with the largest responsibility for funding the science and mathematics education and research enterprise in the U.S. The funds would be administered in such a manner as to assure high visibility for the centers. Cooperation with the private sector will be promoted in order to increase the possibility of continued support once the fund for their development terminates.

### *U.S. Hispanic Academy in Science, Technology and Education*

We are committed to increasing the successful academic preparation of Hispanic Americans for participation in science and engineering careers. This can be achieved if educational institutions are held accountable for access, retention and graduation of Hispanic Americans. The MASH organization representatives are committed to ensuring that public and private institutions are held accountable for their performance.

Two approaches are available to achieve these goals. First, political efforts can be focused on achieving these goals. We urge that political action be pursued immediately. Second, we believe that efforts should be made through mobilization of successful Hispanic scientists, engineers and science teachers to assume responsibility for participating in the assessment of the performance of American educational institutions.

We recommend that a new organization be created to bring together Hispanic individuals with a record of high level professional accomplishment and excellence in Science, Technology and Science Education (ST/SE) to participate in a common endeavor that will permit experienced Hispanics to assess the performance of educational institutions in the successful education of Hispanic students.

### *Plan of Action*

We thus propose that a U.S. Hispanic Academy in Science, Technology and Education (USHASTE) be created. The development of such a proposed academy would require convening 30–50 Hispanic individuals with outstanding credentials in science and technology to discuss the development and objectives of the Academy. This meeting will be convened with the support of a private philanthropic organization. It is our hope that a prominent executive of a U.S science and technology corporation, who is well aware of the need to develop Hispanic talent in science and technology, will agree to address this gathering.

As the initial meeting of Hispanic science and technology professionals will determine the main objectives of USHASTE, it is proposed

that one of its main objectives will involve advising and following recruitment and retention programs of a number of universities. Another important responsibility of the proposed Academy will be the development of young Hispanic individuals who show interest and capability in fostering the goals of continued successful participation of Hispanics in science and technology careers. The Academy will complement and support the activities developed by other Hispanic organizations.

The Academy will include Hispanic individuals with a distinguished record of contributions to the advancement of the Hispanic community. We urge that membership in the Academy initially be through the selection of the most outstanding Hispanic individuals drawn from nominations submitted by each of the organizations participating in the first MASH summit. We also recommend that election to USHASTE be for a 5 year term of service once an orderly process has been initiated.■

## Reference


ASPIRA. 1983. *Racial and ethnic high school drop out rate in New York: A summary report.* New York: ASPIRA.

Quality Education for Minorities Project (QEM). 1990. *Education that works: An action plan for the education of minorities.* Cambridge, MA: Massachusetts Institute of Technology.

Malcom, S.M. 1984. *Equity and excellence: Compatible goals.* Washington, DC: American Association for the Advancement of Science.

Marinez, D.I. & Ortiz de Montellano, B. 1983, May. Teaching culturally relevant science. Paper presented at the 1983 Michigan Annual Hispanic Education Conference, Dearborn, MI.

National Science Foundation. 1988. *Women and minorities in science and engineering.* Washington, DC: National Science Foundation.

Rendón, L.I. & Triana, E.M. 1989. *Making mathematics and science work for Hispanics.* Washington, DC: American Association for the Advancement of Science.

Rutherford, F.J. & Ahlgren, A. 1989. *Science for all americans.* New York: Oxford University Press.

Task Force on Women, Minorities and the Handicapped in Science and Technology. 1989. *Changing America: The new face of science and engineering.* Washington, DC: National Science Foundation.

U.S. Department of Education. 1991. *America 2000: An education strategy.* Washington, DC: U.S. Department of Education.

# MASH Message

A variety of factors have contributed to current efforts at curriculum reform and educational assessment that are unprecedented in their magnitude and scope. Motivated by desires to improve the mathematical and scientific skills of all students in this nation, federal and private agencies have funded several broad initiatives along these lines. As an example, the American Association for the Advancement of Science (AAAS) Project 2061 convened five scientific panels to address the question of what science, mathematics, and technology students should understand from kindergarten through high school. The resulting publication, *Science for All Americans* (1989), and the accompanying panel reports outline recommendations for scientific literacy. The project's second phrase aim is to develop benchmarks for science literacy that will help to shape science curriculum nationwide. Similarly, the National Science Foundation (NSF) has made major multi-year grants to states that have proposed methods to effect systemic improvements throughout their state in the teaching of mathematics and science.

The MASH Summit participants endorse and greatly appreciate the need to reform mathematics and science teaching. Specifically, we advocate approaches that emphasize hands-on "learning," open-ended and flexible approaches that will ultimately lead to theme based curricula and individualized student portfolio based assessment. We favor the inclusion of multicultural thematic material and appreciate the effectiveness of a variety of "partnerships" in science education.

However, we are not aware of any such major curricula reform efforts that have specifically addressed the language and cultural attributes of the Hispanic child. These are very real and important factors that have to be incorporated if the success of curricula reform is to be extended to Hispanic students.

Similarly the attributes of the Hispanic child must be included in attempts to create better assessment methods. For example, studies are currently underway to assess the cultural and linguistic influence of the testing of cognitive skills of Latino students, and these must be incorporated into any reform of assessment.

*Proclamation Statement*

The summit endorsed the many current efforts aimed at curriculum reform and assessment reform currently under development by a number of associations and government agencies. However, these efforts must have full participation from Hispanic mathematics and science professional associations as well as Hispanic community organizations with educational outreach programs. Furthermore, reform efforts should specifically address the linguistic, cultural and socioeconomic factors involved in educating the Hispanic child.

Without the participation of the Hispanic scientific and educational community and the full inclusion of the language and social factors mentioned above, all such efforts are inadequate and will perpetuate the low achievement of mathematical and scientific skills of Hispanic students.

This proclamation statement is addressed specifically to professional and governmental associations currently overseeing major education reform efforts. These include programs and initiatives from:

**AAAS, Project 2061**

**Mathematical Sciences Education Board**

**National Council of Teachers of Mathematics (NCTM)**

**National Institutes of Health**

**National Science Teachers Association (NSTA)**

**NRC, National Science Education Standards Project**

**NSF, Education and Human Resources Programs**

**NSF, Statewide Systemic Initiatives**

**Quality Education for Minorities Project (Q.E.M.)**

**U.S. Department of Education**

**White House Initiatives**

# Afterthoughts

*Ralph Gonzalez*

## The Big Picture

As an aerospace engineer concerned about the minority participation in science and technology fields, and as MAES national president interested in encouraging and supporting MAES chapters to work to prepare youth in science and mathematics, it was my task at the Mathematics and Science for Hispanics (MASH) Summit to lead several colleagues in outlining how, and in what ways, to prepare and engage educators. While we concentrated on teachers, thoughts never strayed far from questioning "What do Hispanic children need from teachers to excel in science and mathematics?"

The growing movement calling for education reform has focused on a number of issues but none more pressing than equity. The consensus has been on the necessity of schools to offer all students an equal opportunity to learn and to succeed. As such, enhancing the skills of educators to deal with changing schools and classrooms, although necessary, may not produce positive results if the schools and teachers do not change the environment for learning (Fradd & Weismantel, 1989).

Prevailing attitudes among many educators and counselors are that minority students are poorly prepared, and therefore unlikely to succeed. With expectations that sooner or later the minority students will fail and dropout, many educators and counselors shun mentorship support. As a consequence, minority students must deal with the harsh reality that they must make it "in spite of the system." Minority students are forced to swim against a relentless current where they are programmed for failure.

Changes in the educational system to address existing attitudes and perceptions are needed from preschool to high school and beyond. Education reform should consider the interdependence of equity and attitudes. That is, the philosophy of what the ideal teacher and school

would look like should be the basis from which we begin to formulate reform and make recommendations for teachers and school improvement.

## The Ideal

The ideal educator is the "prime catalyst" in motivating each student to enjoy learning. When successfully accomplished, the educator should obtain from the student an inspirational responsiveness to the educational process. A teacher should also serve as a "mentor" and establish a sincere and interactive interest in each student's development. The ideal educator would be able to demonstrate expert knowledge in the subject matter by carefully selecting the most appropriate teaching approach to maximize the ability to learn by each student.

The ideal educator will also recognize the cultural diversity represented in the classroom and will use it as an opportunity to enhance the classroom environment. Furthermore, in addressing the needs of the minority student, the ideal educator will establish inclusive cultural linkage by recognizing the historical accomplishments of minority groups in the United States. In accomplishing this task, the teacher will be able to create a positive and sharing environment for all the students. Additionally, the ideal teacher will invite "role models" to enhance the classroom experience for each student.

The ideal school would address "cultural diversity" in a positive manner. On a regular basis, the school would examine individual biases, racial attitudes and ethnic stereotypes that influence personal interactions which may keep minority students from succeeding in the classroom. The ideal school would pursue this until such obstacles that impede successful achievement are overcome and the school becomes an environment conducive to learning for all students.

## Ideal to Reality

In order to establish long term systemic change, educational institutions must eradicate schools' inhospitable climate and the low expectations currently held by educators and counselors for minority students. The ideal needs to become the norm. Workshops and

professional development seminars that aim to better prepare educators should include substantial time for discussing educator perceptions and the learning atmospheres that minority children face. Educators would be evaluated and held accountable to specific objectives that would address equity and perceptions in the classroom.

Critical to achieving equity and changing perception is having the administrators, the leaders of the school, set the example. The atmosphere of the school needs to be that all children can learn, and achieve. The thinking should be pervasive that science and mathematics are for everyone. Consequently workshops will need to target the leaders of the schools. As the educators are to be held accountable so should the principals.

Finally, school boards should be involved from the first to initiate these changes. It is essential for parents and community members to put pressure on school board members to make equity a priority. School boards should set aside funds for schools to hold mandatory teacher and administrator workshops. Incentives such as rewards and recognition for those schools that demonstrate strides in creating a climate open to learning for all children would provide the additional push for schools and teachers.

In reflecting on the many recommendations enumerated at the MASH Summit, I believe, to make reform a reality we must start with the premise that all children can learn. We must believe that all children can learn mathematics and science. We must believe that creating an environment conducive to learning is the school's and university's as well as the educator's number one responsibility.■

## References

Fradd, S.H. & Weismantel, M.J 1989. *Meeting the Needs of Culturally and Linguistically Different Students: A Handbook for Educators.* Boston, MA: College-Hill Press.

Matyas, M.L. & Triana, E.M. 1992. *Proyecto Futuro/Project Future: Improving elementary and middle school education for Hispanic children.* (U.S. Department of Education Final Report #R168D001100). Washington, DC: American Association for the Advancement of Science.

# The Future

The spirit of collaboration felt at the MASH Summit gave birth to a coalition, the Hispanic Secretariat on Mathematics and Science Education. The group drafted a Preamble at the MASH Summit and a steering committee was formed with member organizations' representatives. In June 1992, the Secreatariat formalized its intentions. Since the Summit the steering committee has met regularly. The network established is already stimulating cooperative efforts among the member organizations, thus proving the hypothesis that together we can achieve success.

## Hispanic Secretariat on Mathematics and Science Education Preamble

The Hispanic Secretariat on Mathematics and Science Education is a unified coalition of national Hispanic professional, scientific, educational and community-based organizations. Its goal is to provide an effective mechanism for the development and promotion of a national strategy for the educational needs of the Hispanic American population in mathematics and science.

The principal objectives of the Secretariat are: 1) to develop a national strategy for the improvement of mathematics and science education for Hispanic Americans; 2) to secure resources to implement the objectives of the strategy; and 3) to develop a broad agenda by consensus to increase the numbers of Hispanic scientists and engineers.

The main activities of the Secretariat are: 1) the coordination of mathematics and science legislative initiatives; 2) monitoring and assisting federal mathematics and science efforts; 3) promotion of networking assistance in mathematics and science activities; 4) service as a clearinghouse on Hispanic mathematics and science education information and resources for Hispanic Americans; and 5) assistance to the Hispanic American population on locating and utilizing federal funds for mathematics and science education efforts.

The Hispanic Secretariat on Mathematics and Science Education was established in May 1992, in the Washington, DC metropolitan area, and is composed by the Association of Puerto Ricans in Science and Engineering; ASPIRA Association Inc.; Hispanic Association of Colleges and Universities; Interamerican College of Physicians and Surgeons; League of United Latin American Citizens; LULAC National Educational Service Centers; National Council of La Raza, SER Jobs for Progress Inc.; Society for the Advancement of Chicanos and Native Americans in Science; Society of Hispanic Professional Engineers; and Society of Mexican American Engineers and Scientists.■

# United-Unidos

*Betty Mandel*

When the plans for the MASH Summit were being developed, some the questions that had to be addressed more often were: Why are Hispanics underrepresented in these disciplines; Why a Hispanic Summit with such a diverse representation?; and even more important, Why mathematics and science education?

"Why mathematics and science education." Because we have to. There is no longer a choice. We have all heard, discussed or read about how other industrialized countries have a higher per capita representation of engineers and scientists and how the competitive edge of this nation in a world market economy depends on the ability to embark in greater technological challenges. The shift in the workforce to " high tech" disciplines is already evident in many industries, from automobiles and steel to the construction industry. These American industries, particularly the first two, have undergone serious transformations to survive and compete with newer, better equipped production facilities with highly "trained" personnel in countries like Japan and Germany.

Everyone agrees that we must increase the interest of our young population in mathematics and science. This is easier said than done: the math and science education in this country is in crisis. Yet by the time youngsters in grade school graduate and join the workforce, most opportunities will be in the scientific and technologically related fields. Hispanics are the fastest growing minority population of the United States, and a segment that has been underutilized and underdeveloped. Thus, Hispanics are a resource that cannot be ignored. They must be brought to the mainstream of America.

Which brings up the question, "Why a Hispanic Summit with such diverse representation?" The first step is in realizing that everyone has a stake in this issue. Those not considered to be part of the solution will perpetuate the problem. A number of Hispanic professional and community organizations with diverse education objectives have for sometime worked to assist the Hispanic community. However, the communication and collaboration between each is limited at best with little to

no collaborative efforts to address the science and mathematics preparation of Hispanic youth.

This brings up the first question, "Why are Hispanics underrepresented in mathematics and science related fields?" Without going into the detail already covered in this report, I would like to zero in on the root of the problem. The real question is, why are Hispanics dropping out of school before they get to high school, and why are they dropping out of high school before they graduate?

The truth is that the drop out rates of this population are alarming, and something has to be done. How can Hispanics not be underrepresented if they are leaving the system before reaching high school? Without an education Hispanics will always be underrepresented in math and science-related fields, or for that matter, in any field. Leaving such a large segment of the workforce untrained makes no sense; it is a lose-lose proposition. Yet, how can Hispanics reach "parity" in a system that does not hold a part for them? Thus, the problem is much deeper than originally stated. For many young Hispanics the perception of belonging to the mainstream of this society is nonexistent.

The problem of underrepresentation is a complex one that does not have one set of solutions or reasons for the problem. I could state how Hispanics are in the lower echelons of our economic strata and how this affects their participation and pursuit of college education. I can talk about the cultural differences, the language barriers, or discrimination. But I choose not to. All of these issues have been addressed before in numerous articles, studies and by more than one task force. Instead, I choose to seek answers that will help us, all of us, solve the problem. A strategy is needed for releasing the unlimited potential that the power of knowledge has for every individual plan for empowerment.

Where do we start? EVERYWHERE. The problem is systemic, and it needs to be reviewed in its entirety. We can no longer afford to look at individual pieces of the puzzle when the entire puzzle is staring at us with despair. A strategic plan of "attack" is needed to bring all the puzzle pieces together. Partnerships need to develop between parents, students, teachers, government, and industry. At the same time, Hispanic community and professional science organizations serving all

these parties, must also form a partnership aimed at addressing the preparation in science and mathematics and underrepresentation of Hispanics.

Each partner has a mission. Parents must take an active part in the education of their children starting at birth. Teachers must be able to capture the students' imaginations early on, with curriculum and materials geared to this endeavor throughout the child's education. Communities must stimulate and reward educational excellence, mentoring, guiding and protecting this precious resource. Government and industry have the fiscal and moral responsibility to provide the support needed to stimulate the changes required. Science organizations can enhance school and home efforts through their mentoring and educational programs. Furthermore, through a Hispanic organization partnership all partners, Hispanic and non-Hispanic, can be held accountable to their commitments.

I have not yet answered, categorically, our first question, "Why are Hispanics underrepresented in mathematics and science careers? We all know the many answers. While the problem can be studied to any length and be broken in as many portions as necessary, the problem will still be there. We have been doing this for years, but the magic solution is not in a report. The solution is action.

The organizations represented in the MASH summit possess a repertoire of mentoring and educational programs that are actively being implemented. Each organization represented has a different constituency, objective, program, and a different niche. Together, the organizations represented at the MASH Summit cover the life cycle of education, from preschool to post graduate education. These organizations came together for one major and noble goal: the desire to improve mathematics and science education for Hispanics so that more Hispanics will pursue careers in those fields.

As chair of the Secretariat Steering Committee, I cannot stress enough the belief that high expectations are synonymous with great achievement. If we work together we can develop a nurturing environment, where the youth of tomorrow will feel empowered by their own achievements, where they will feel responsible for their destinies, where they will welcome risk and success, and where they will have hope for the future. And, let us not forget that, their hope is ours.■

## References

Task Force on Women, Minorities and the Handicapped in Science and Technology. 1989. *Changing America: The new face of science and engineering.* Washington, DC: National Science Foundation.

Matyas, M.L. & Triana, E.M. 1992. *Proyecto Futuro/Project Future: Improving elementary and middle school education for Hispanic children.* (U.S. Department of Education Final Report #R168D001100). Washington, DC: American Association for the Advancement of Science.

U.S. Department of Education. 1991. *America 2000: An education strategy.* Washington, DC: U.S. Department of Education.

# List of MASH Participants

## Participants

| | |
|---|---|
| Association of Puerto Ricans in Science and Engineering (APRSE) | *Pablo Clemente-Colon* |
| ASPIRA Association, Inc. | *Hilda Crespo* |
| Hispanic Association of Colleges and Universities (HACU) | *Rafael J. Magallan* |
| Interamerican Colleges of Physicians and Surgeons | *Hipolito Niño* |
| League of United Latin American Citizens (LULAC) | *Ada Peña* |
| LULAC National Educational Service Centers (LNESC) | *Richard Roybal* |
| National Council of La Raza (NCLR) | *Diane Cabrales* |
| SER Jobs for Progress, Inc. | *Gil Gutierrez* |
| Society for the Advancement of Chicanos and Native Americans in Sciences (SACNAS) | *George Castro*<br>*Eugene Cota-Robles*<br>*Ciriaco Gonzales* |
| Society of Hispanic Professional Engineers (SHPE) | *Robert Guzman*<br>*Leonard Abeyta* |
| Society of Mexican American Engineers and Scientists (MAES) | *Ralph Gonzalez*<br>*Betty Mandel* |

## Members at Large

| | |
|---|---|
| The White House Initiative on Hispanic Education | *Susan Hill* |
| National Science Foundation | *Sonia Ortega* |
| American Association for the Advancement of Science (AAAS) | *Manuel Gomez Rodriguez*<br>*Estrella M. Triana* |

# About AAAS

The American Association for the Advancement of Science (AAAS), founded in 1848, is the world's largest federation of scientific and engineering societies. It currently has some 133,000 individual members and nearly 300 affiliated societies and academies of science. AAAS publishes *Science*, the weekly professional journal, and *Science Books & Films*, a critical review journal for schools and libraries.

The programs and activities of the AAAS respond to a broad spectrum of scientific opportunities. In addition to its activities to broaden the human resource pool of scientists and engineers, AAAS programs focus on strengthening school science, mathematics, and technology education, shaping science and technology policy, promoting the public understanding of science, expanding scientific cooperation in global issues, defending scientific freedom, and championing high professional standards.■

# Hispanic Initiatives

The AAAS Hispanic Initiatives Program, through the Directorate for Education and Human Resources Programs, works to advance the status of Hispanics in science and engineering and to strengthen the science, mathematics, and technology education for Hispanic youth. The program holds special educational activities for Hispanics, conducts conferences to address the particular problems that exist for Hispanic students that contribute to their underrepresentation in the sciences, and develops bilingual informational materials for educators, students and their parents. Its multi-year effort, Proyecto Futuro/ Project Future, works with educators to improve elementary and middle school science teaching and learning by providing training, materials, and technical assistance. The project also works with Hispanic parents who can significantly influence and support their children's education.

Over two hundred organizations, and some 3,000 individuals have participated in AAAS Hispanic Initiatives activities. In addition, ten national Hispanic community and science organizations serve in an advisory capacity to the program and assist with program efforts including in the development of the Mathematics and Science for Hispanics (MASH) Summit. For more information, write to AAAS Hispanic Initiatives, 1333 H Street, NW, Room 1103, Washington, DC 20005.■

# Ordering Information

*United-Unidos: Mathematics and Science for Hispanics*, a 64-page report is available for purchase. The cost is $9.95, plus postage and handling. For your convenience, an order form is provided below.

— — — — — — — — — — Order Form — — — — — — — — — —

| Quanity | Stock# | Title | Unit cost | Price |
|---|---|---|---|---|
| _____ | 93-138 | United-Unidos | $ 9.95 | $ _____ |

For shipments to California, add applicable sales tax $ _____

For shipments to Canada, add 7% GST tax $ _____

Postage & handling $ 4.00

**Total** $ _____

Check one: [ ]Checked enclosed [ ]Purchase order attached (institutions only)

Signature _____

Name _____

Institution _____

Address _____

City/State/Zip _____

**Mail to AAAS, Hispanic Initiatives, 1333 H Street NW, Room 1103, Washington, DC 20005. Make checks payable to AAAS. Allow 2–3 weeks for delivery.**